

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

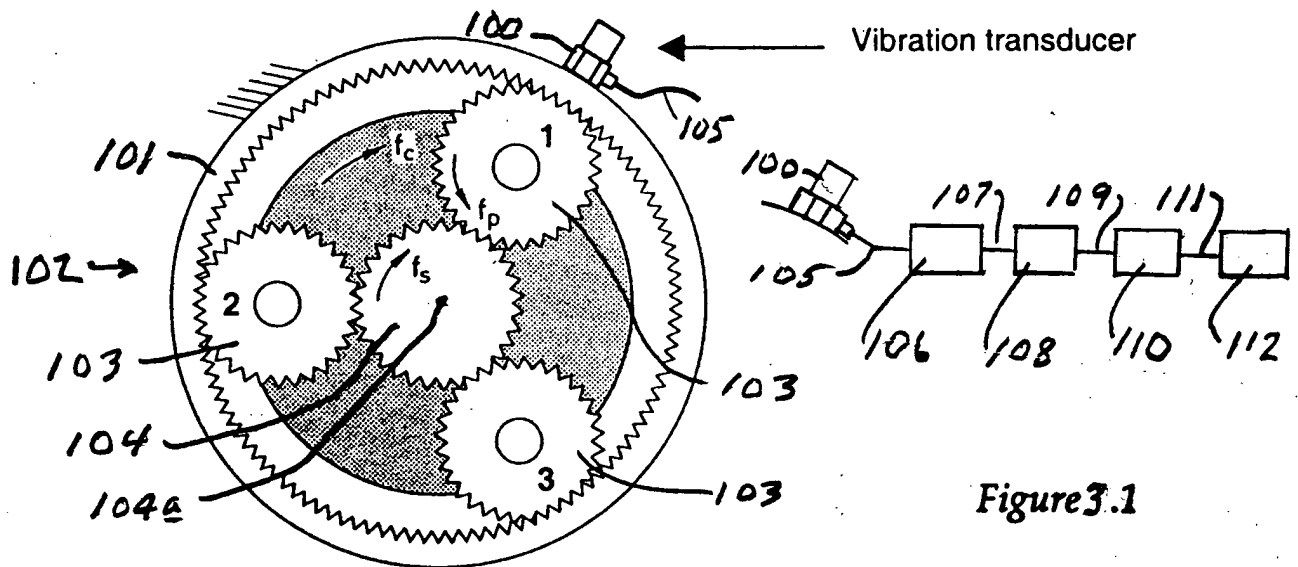


Figure 1.1: A three-planet epicyclic gear train with a fixed ring gear.

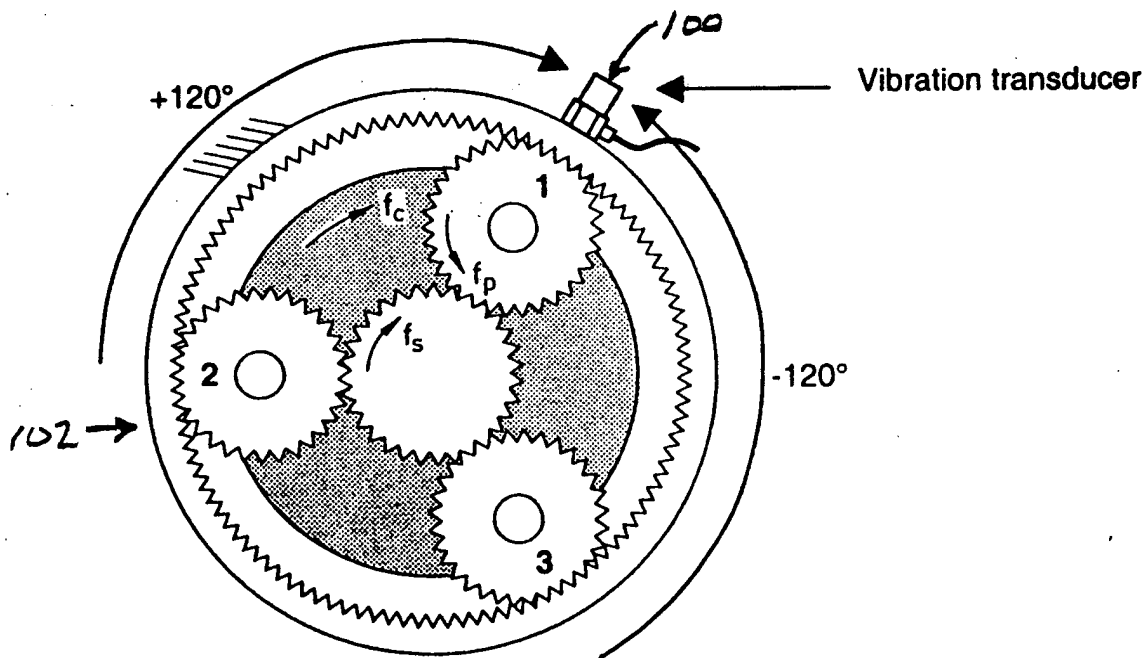


Figure 2.1: Phase shifts required to align the separated sun gear averages in a three-planet gear train.

2-30

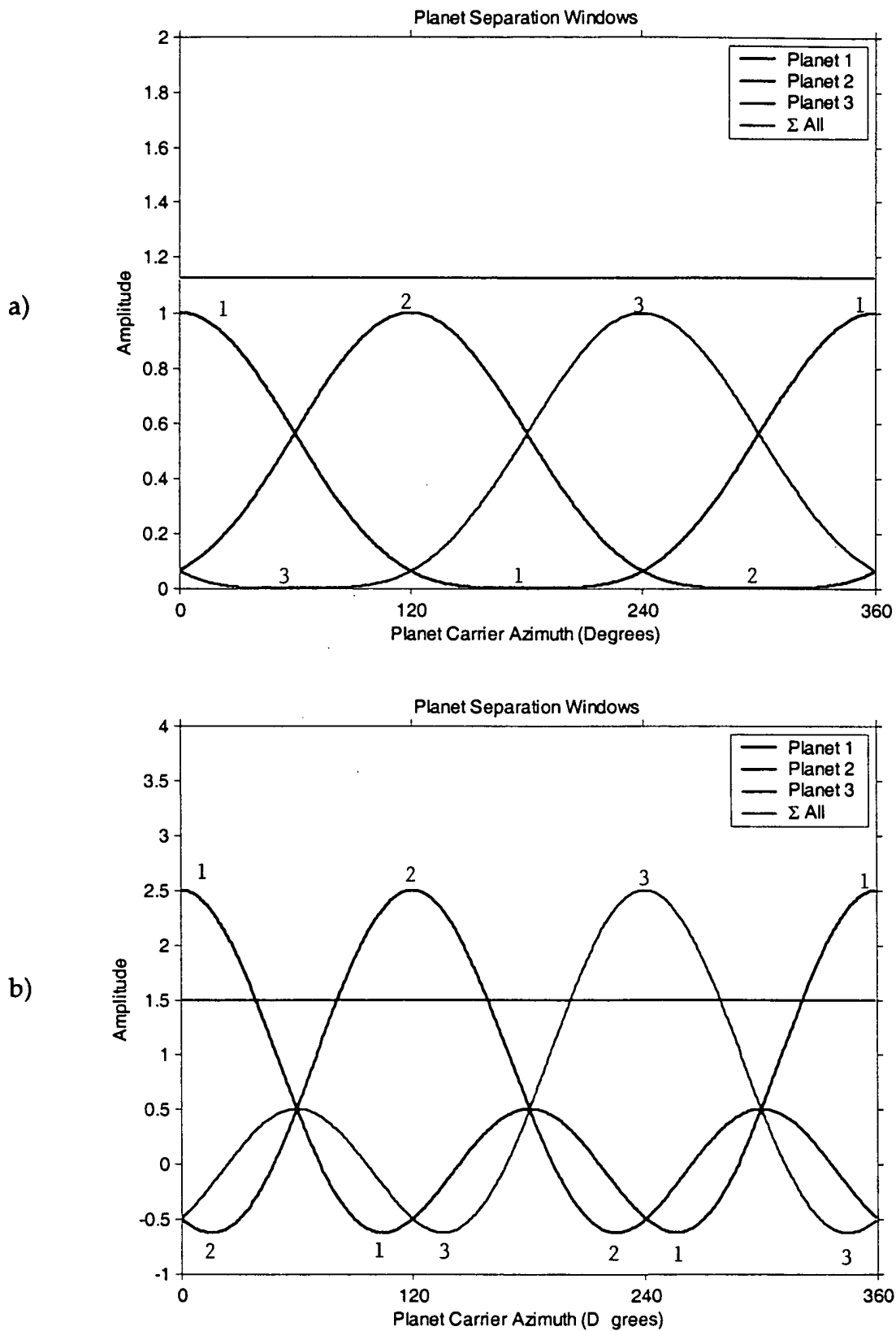


Figure 1.2: Separation window functions for a three-planet gear train: a)  $w_{\text{power}}(t)$ , b)  $w_{\text{sum}}(t)$ .

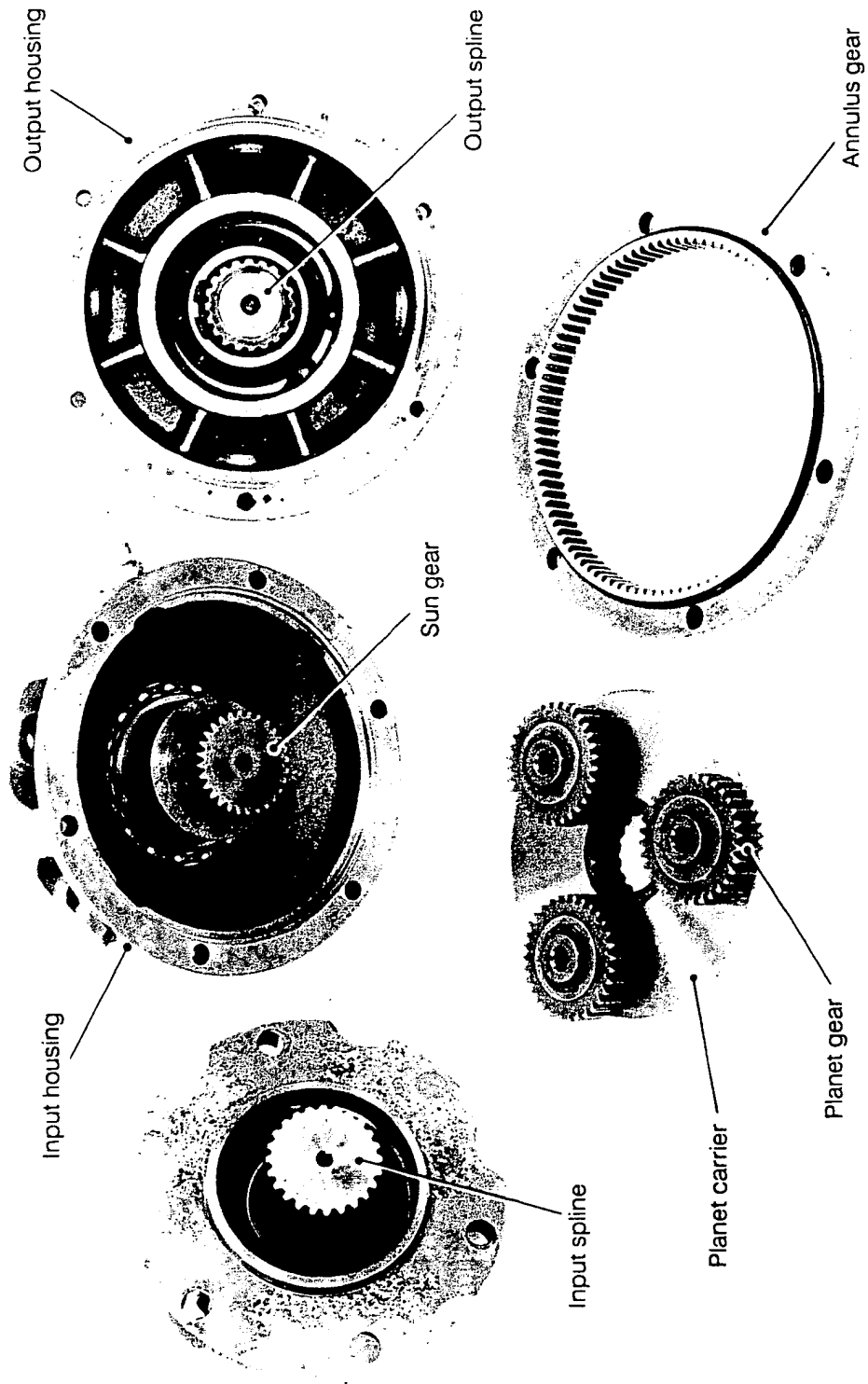


Figure 4.1: Exploded view of Brevini gearbox.

4-30

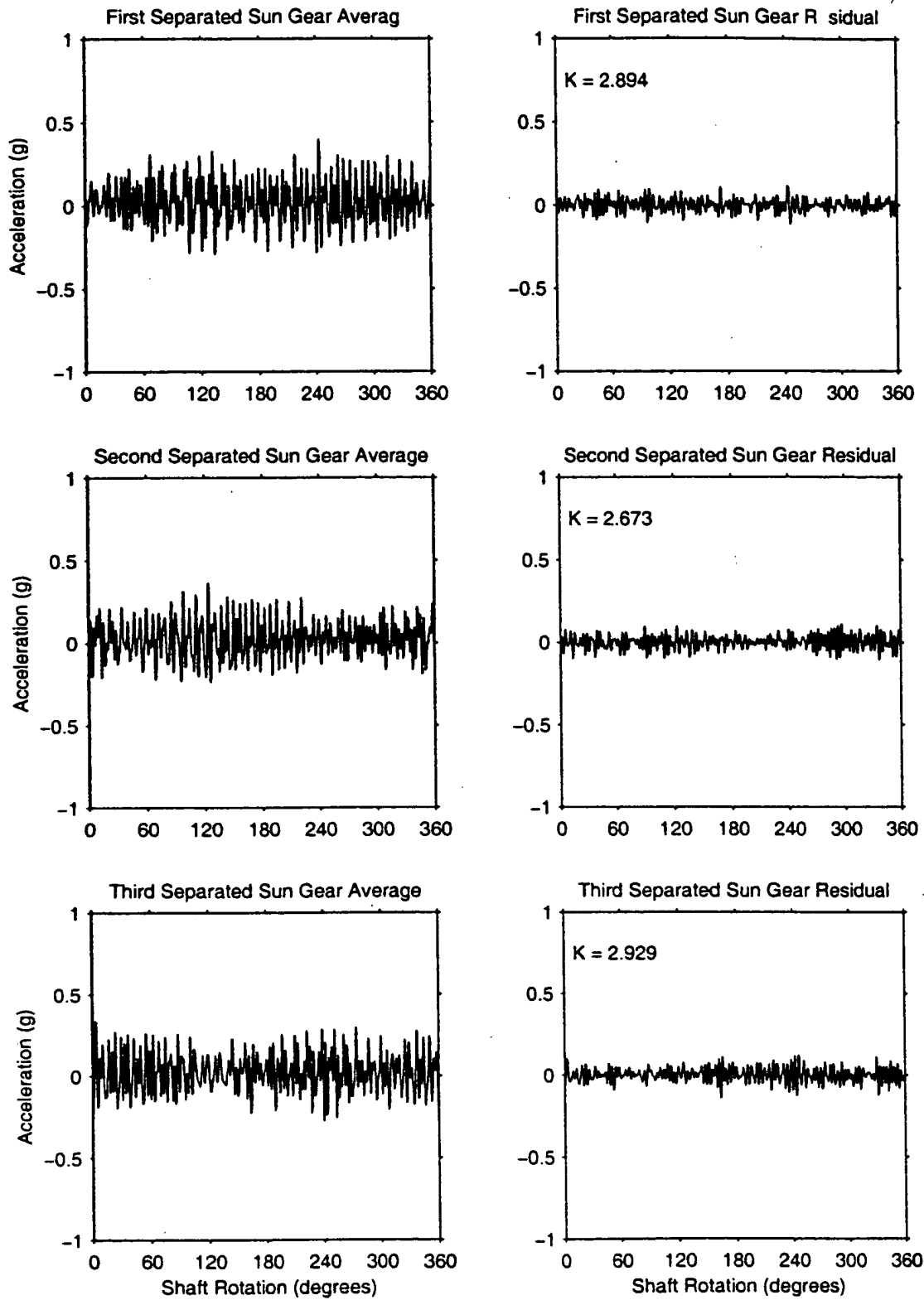


Figure 4.2: Sun gear separations ( $window = w_{power}(t)$ ) – no fault.

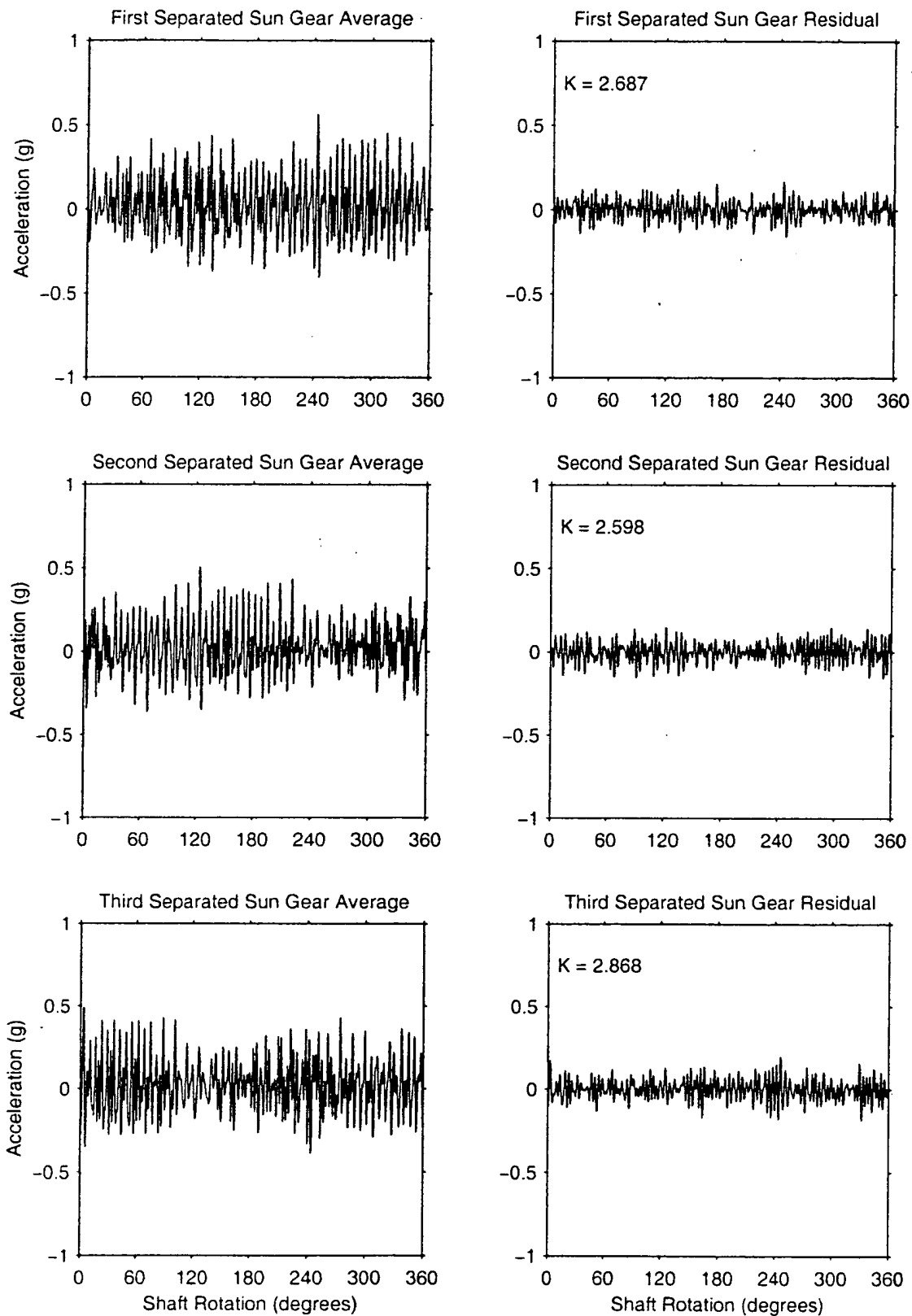


Figure 4.3: Sun gear separations ( $window = w_{sum}(t)$ ) – no fault.

6-30

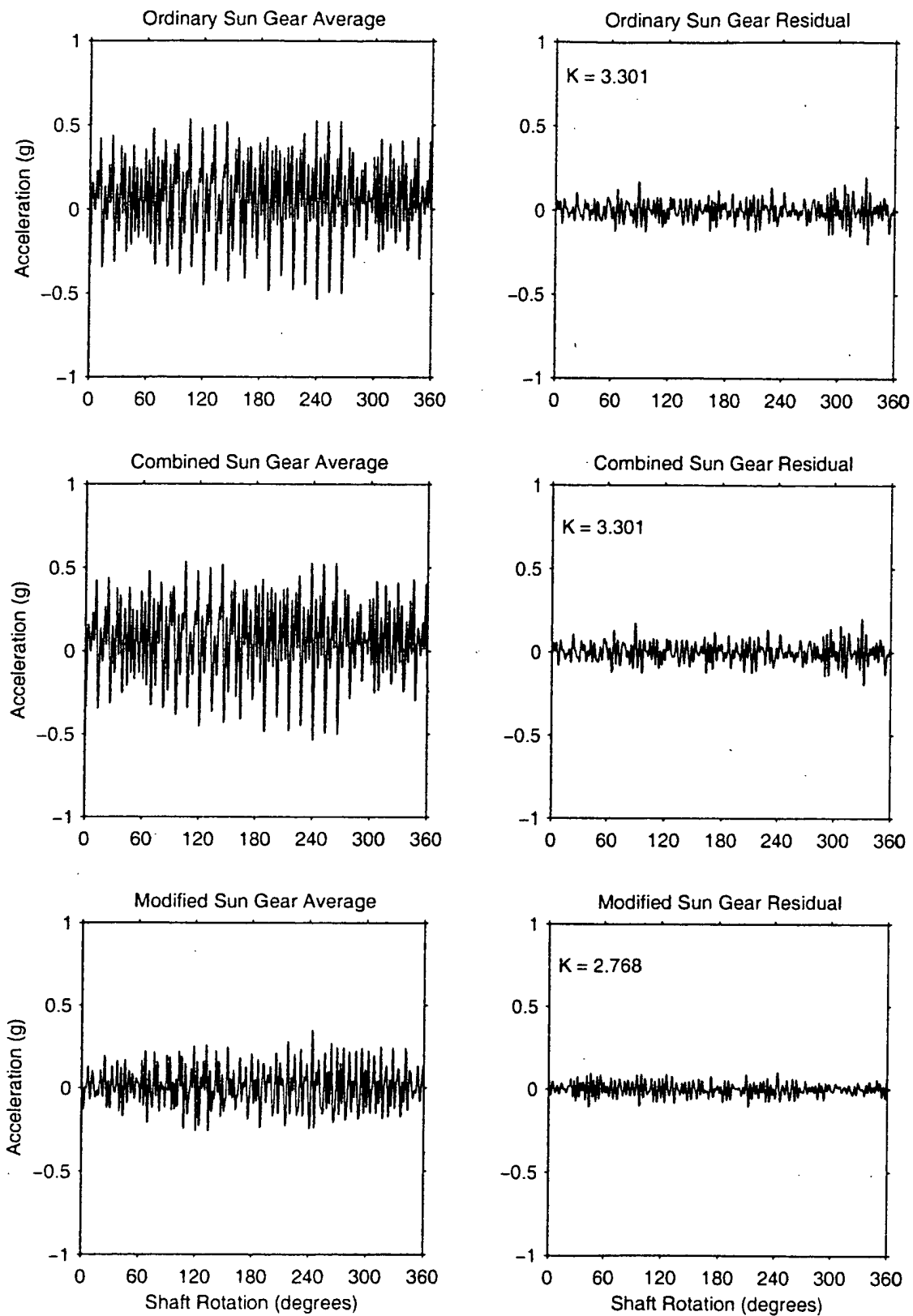


Figure 4.4: Ordinary, combined & modified sun gear averages (window =  $w_{power}(t)$ ) – no fault.

7-20

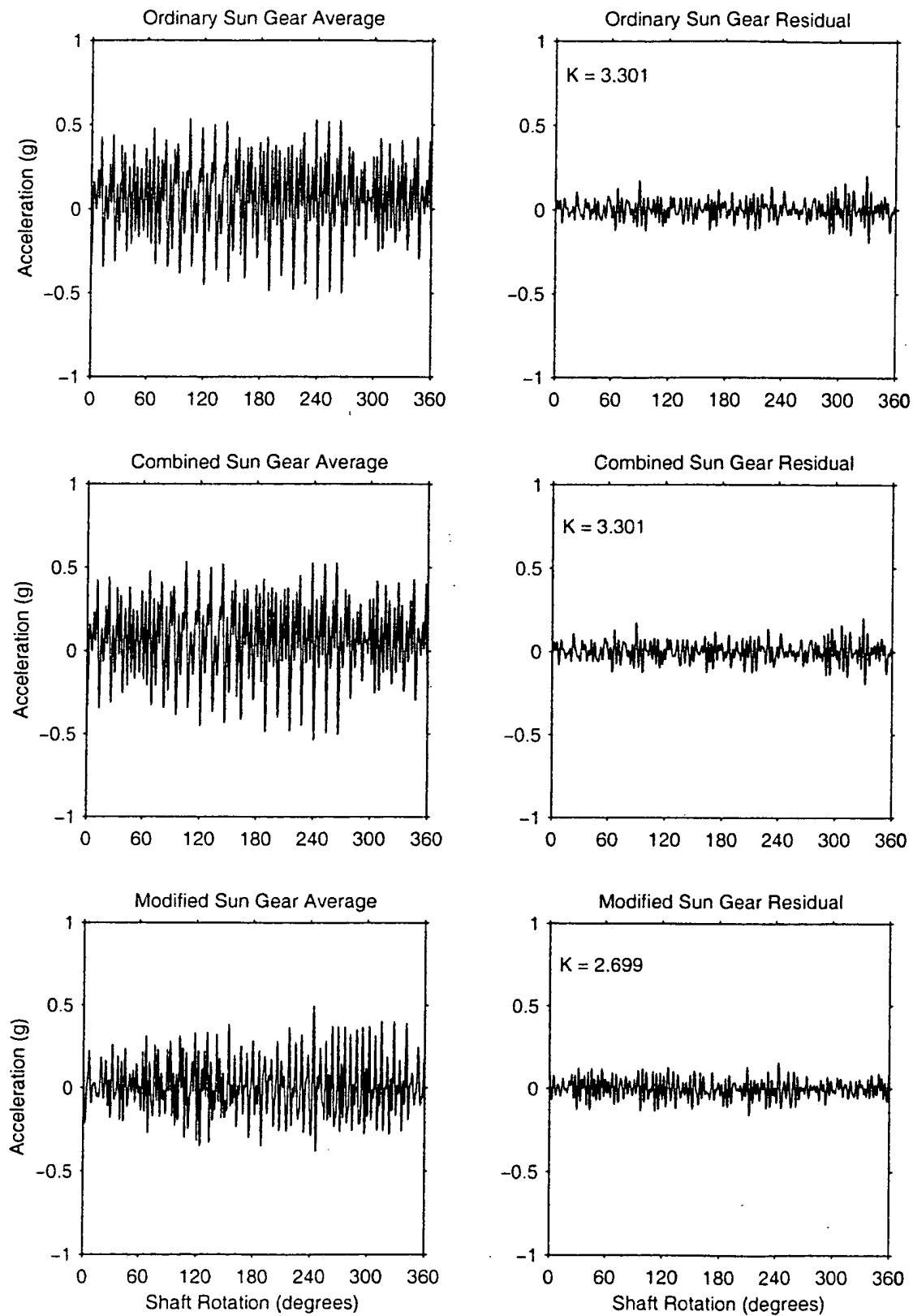


Figure 4.5. Ordinary, combined & modified sun gear averages ( $window = w_{.....}(t)$ ) – no fault.



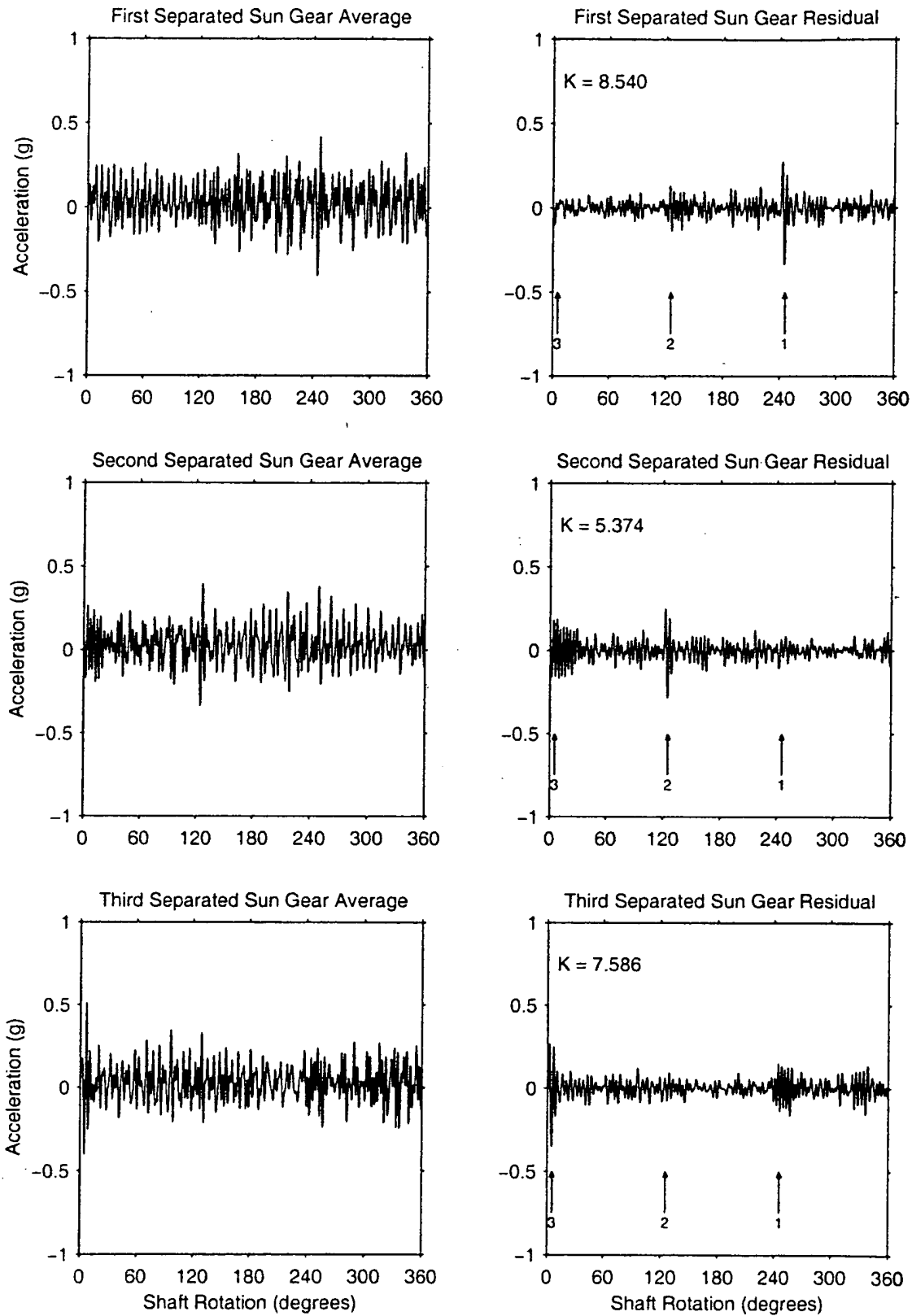


Figure 4.6: Sun gear separations ( $window = w_{power}(t)$ ) – fault.

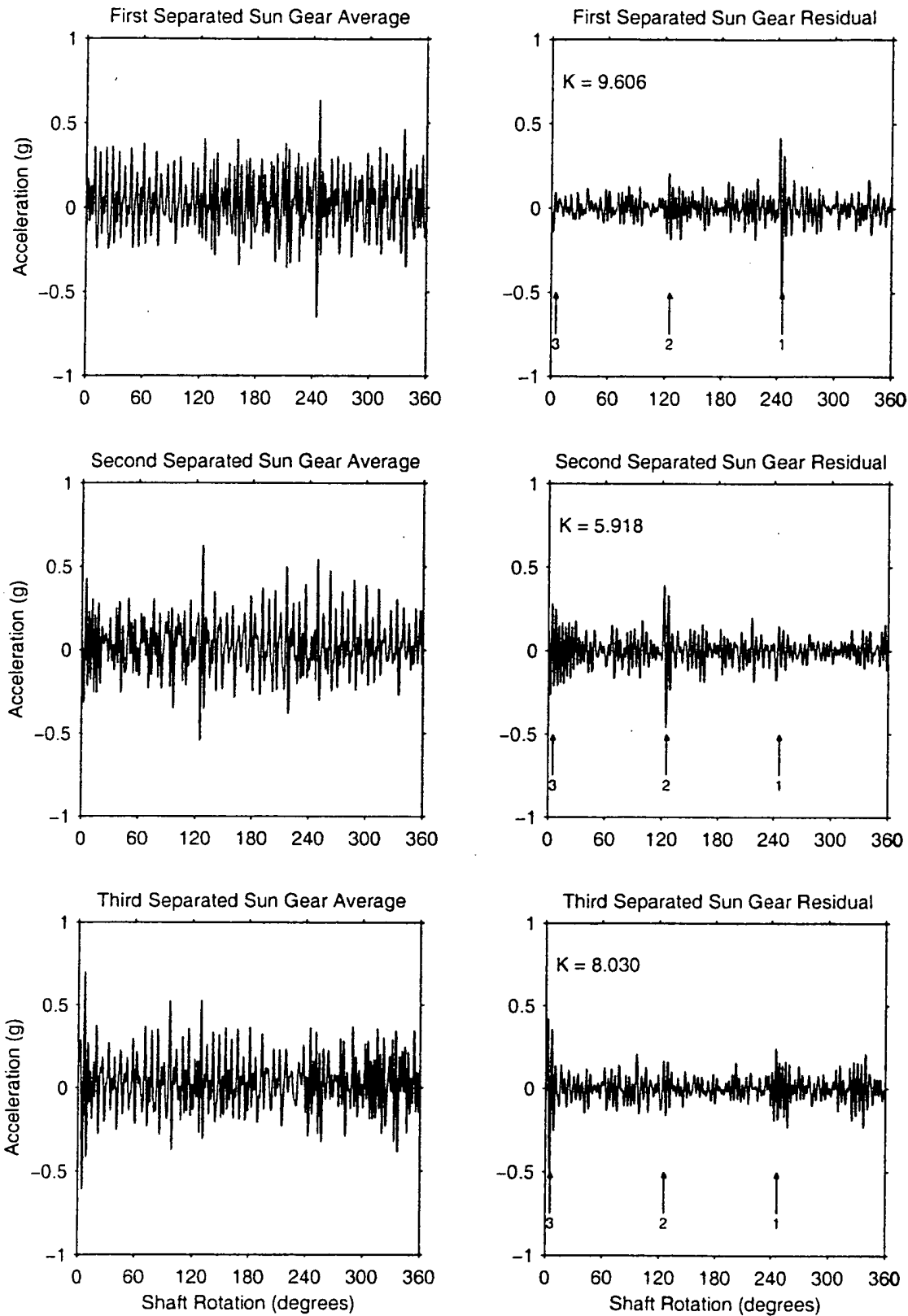


Figure 4.7: Sun gear separations ( $window = w_{sum}(t)$ ) - fault.

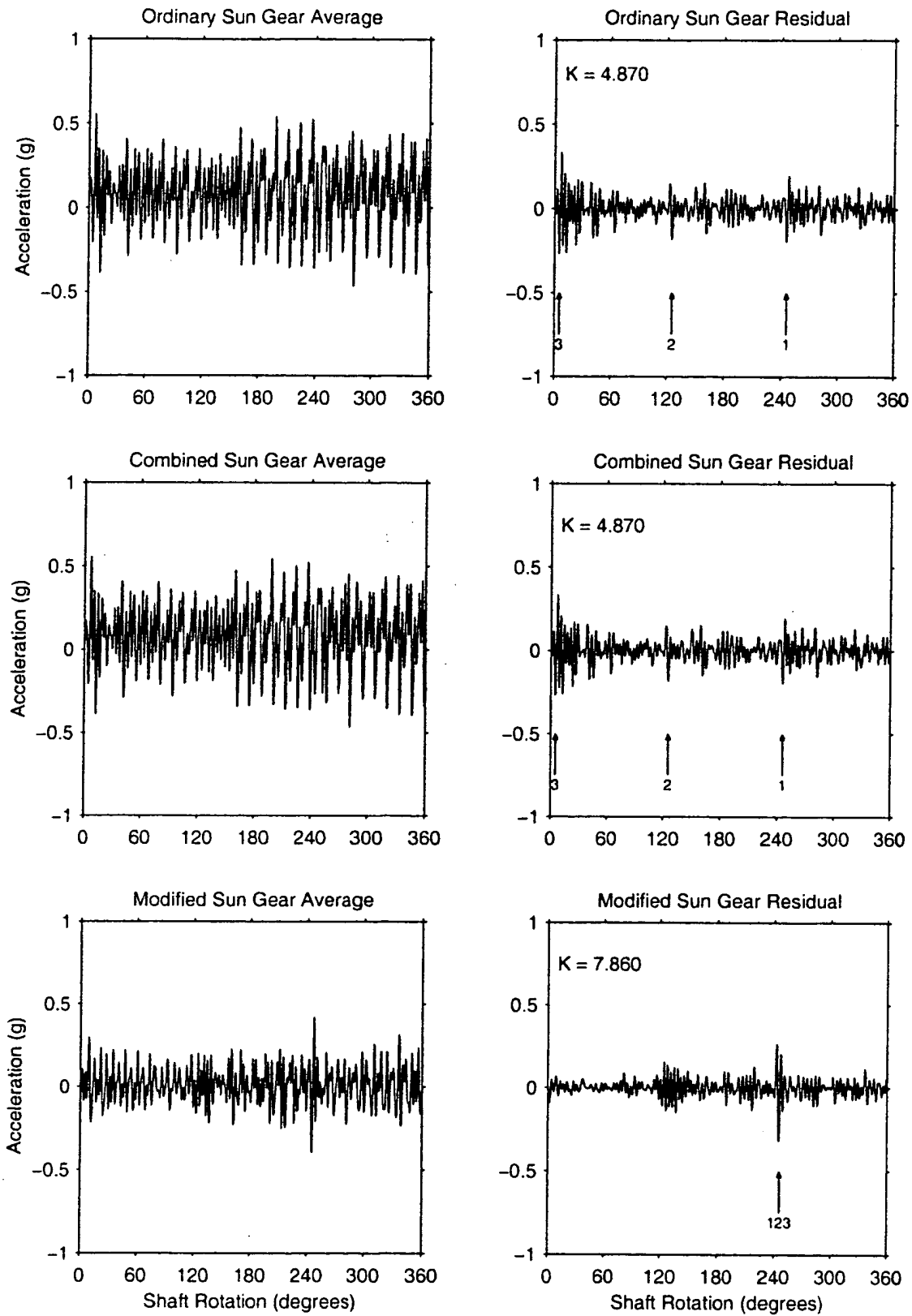


Figure 4.8: Ordinary, combined & modified sun gear averages (window =  $w_{power}(t)$ ) – fault.

11-30

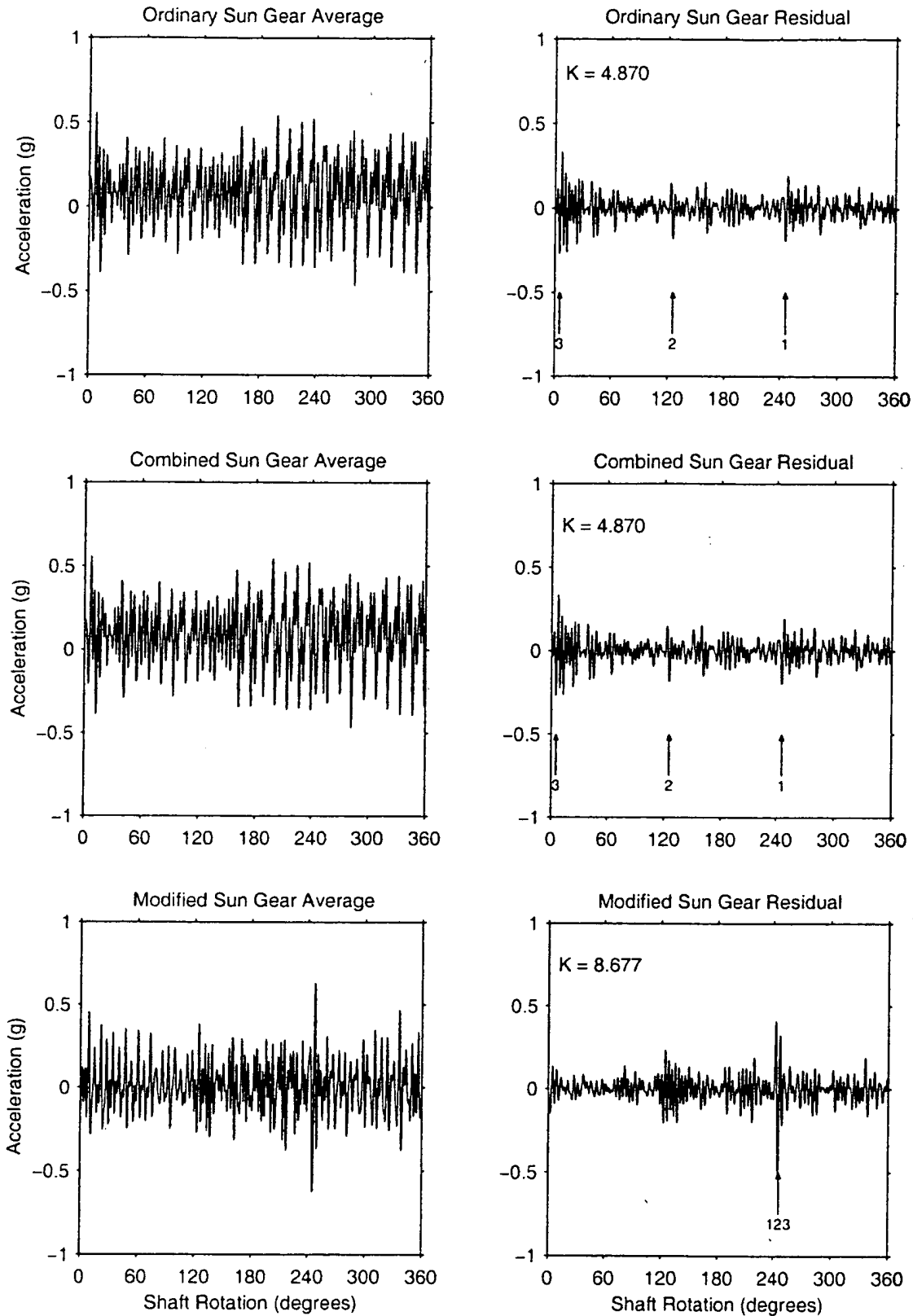


Figure 4.9: Ordinary, combined & modified sun gear averages (window =  $w_{sum}(t)$ ) – fault.

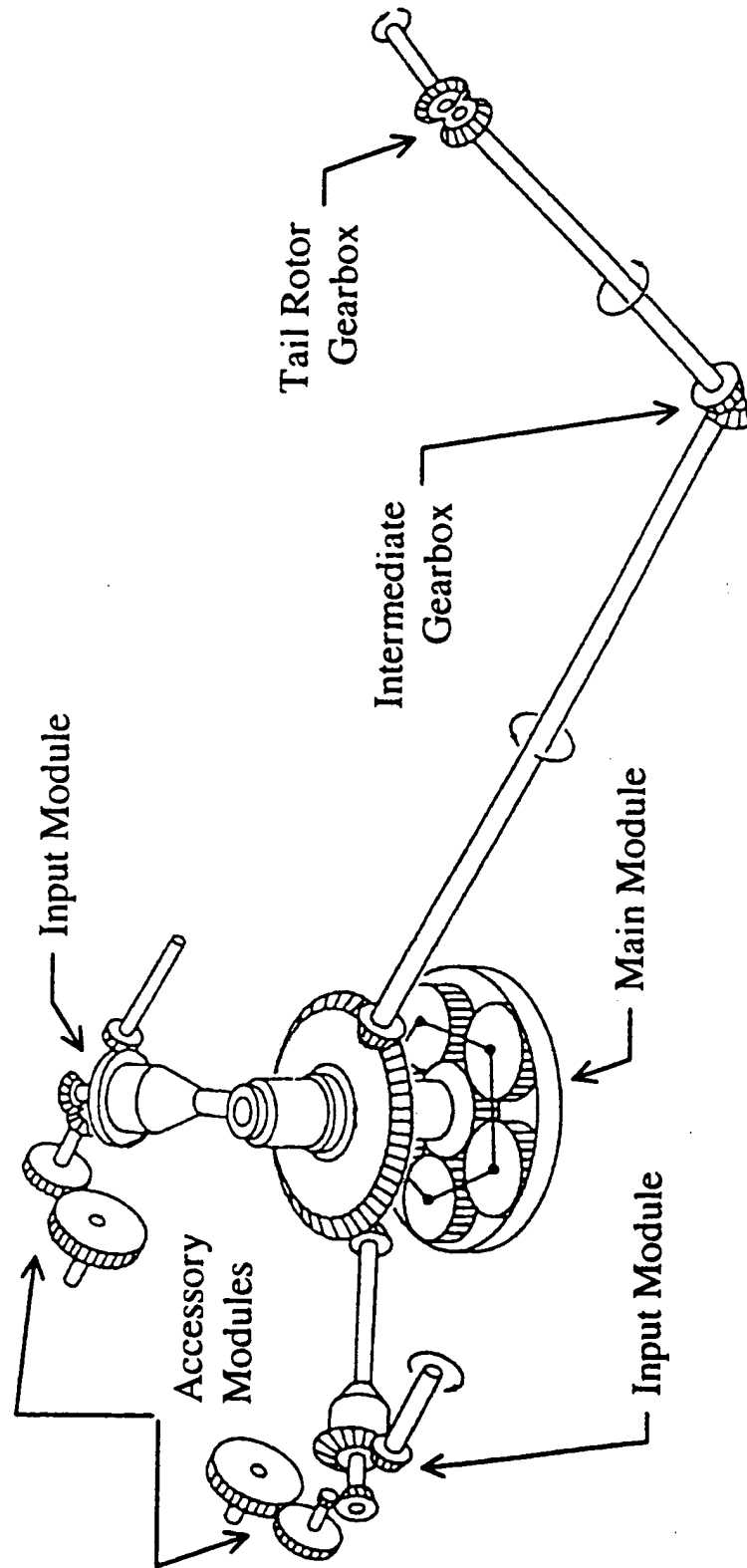


Figure 4.10: Seahawk drivetrain.



Figure 4.11 H-60B sun gear with one third of a tooth removed.

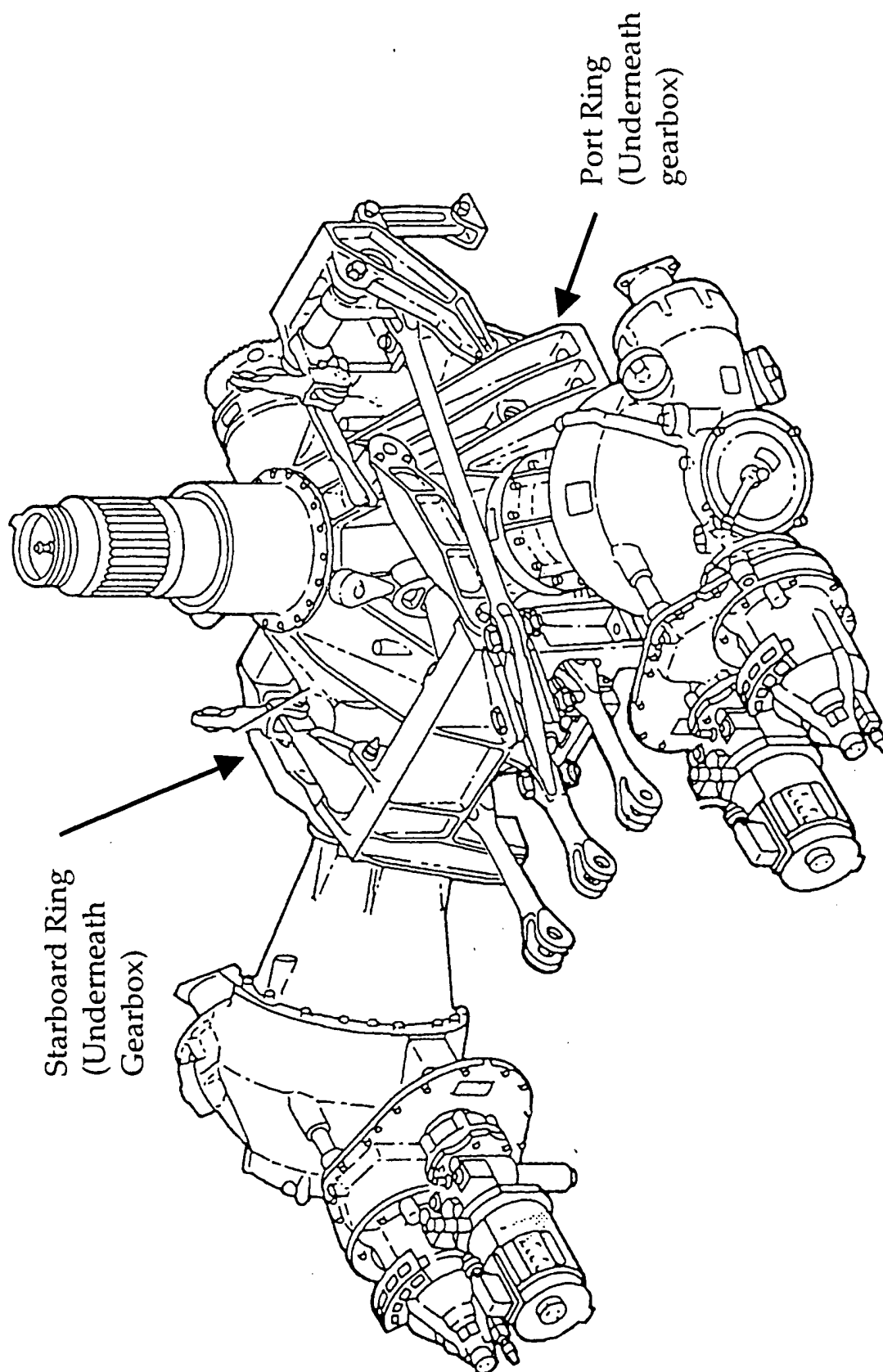


Figure 4.12: Seahawk transmission sensor locations.

15-30

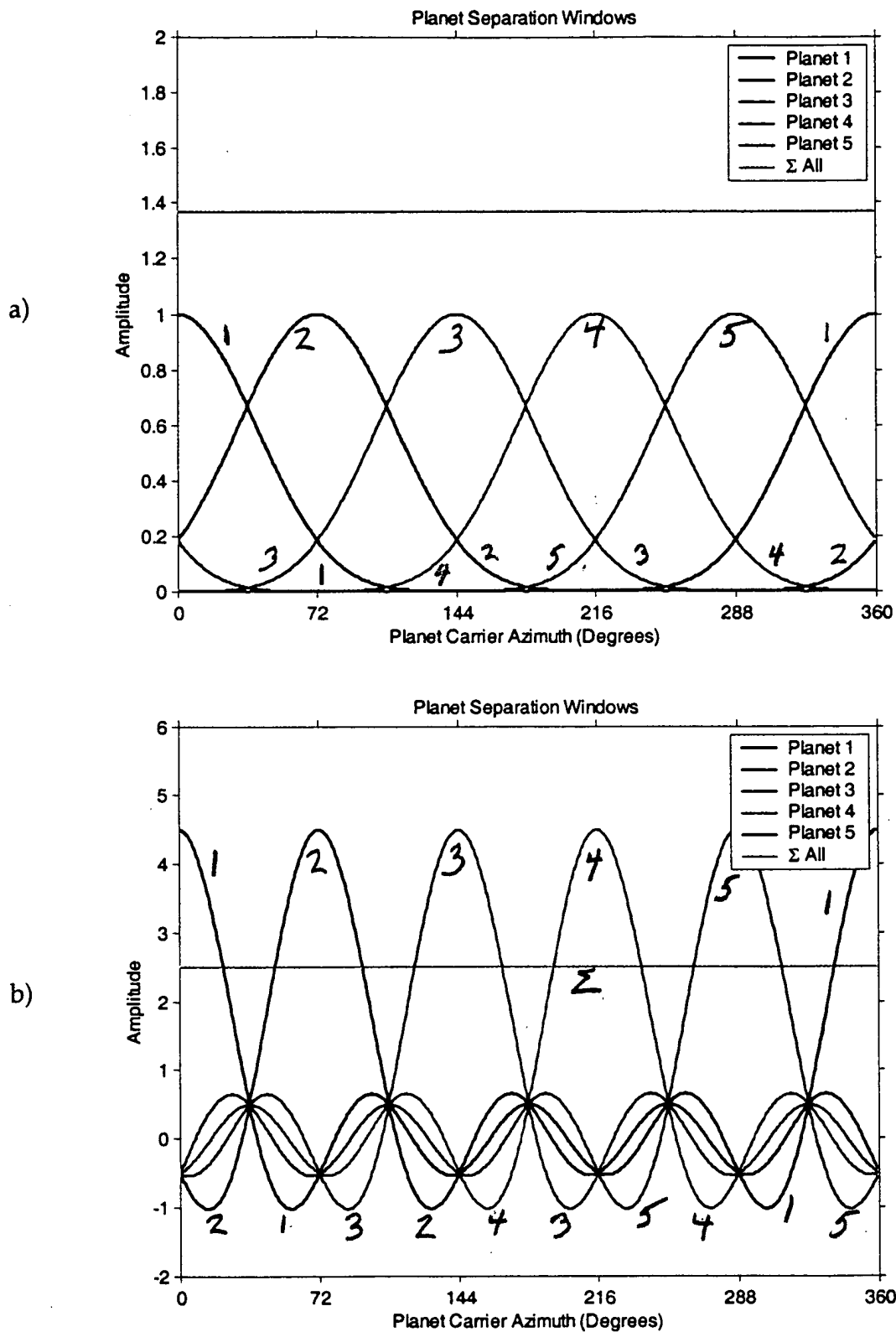


Figure 4.13: Planet separation windows for a five-planet gear train: a)  $w_{power}(t)$ , b)  $w_{sum}(t)$ .



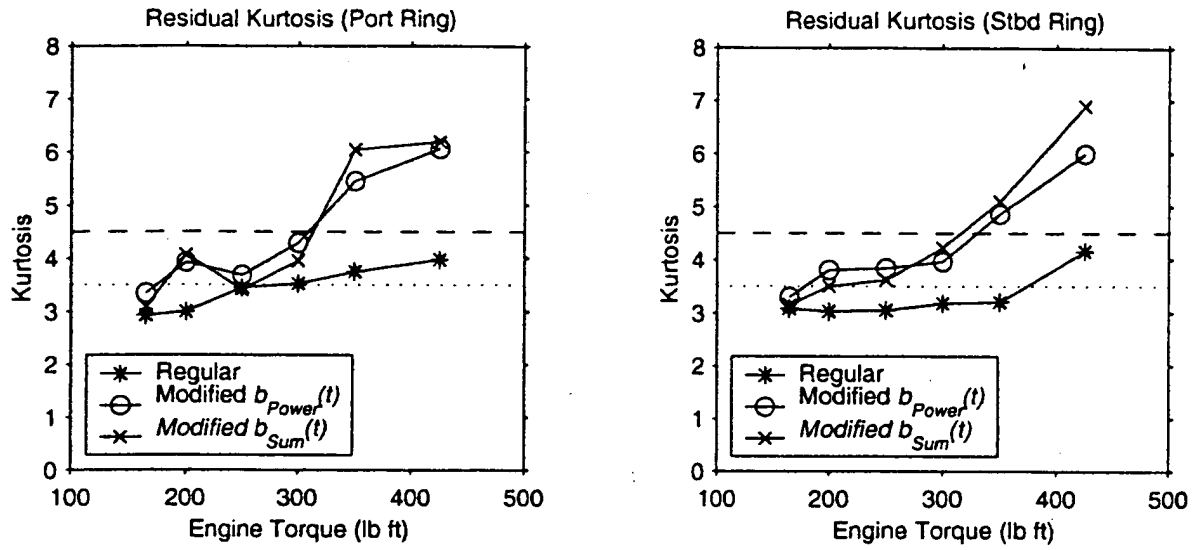


Figure 4.14: Residual signal kurtosis values.

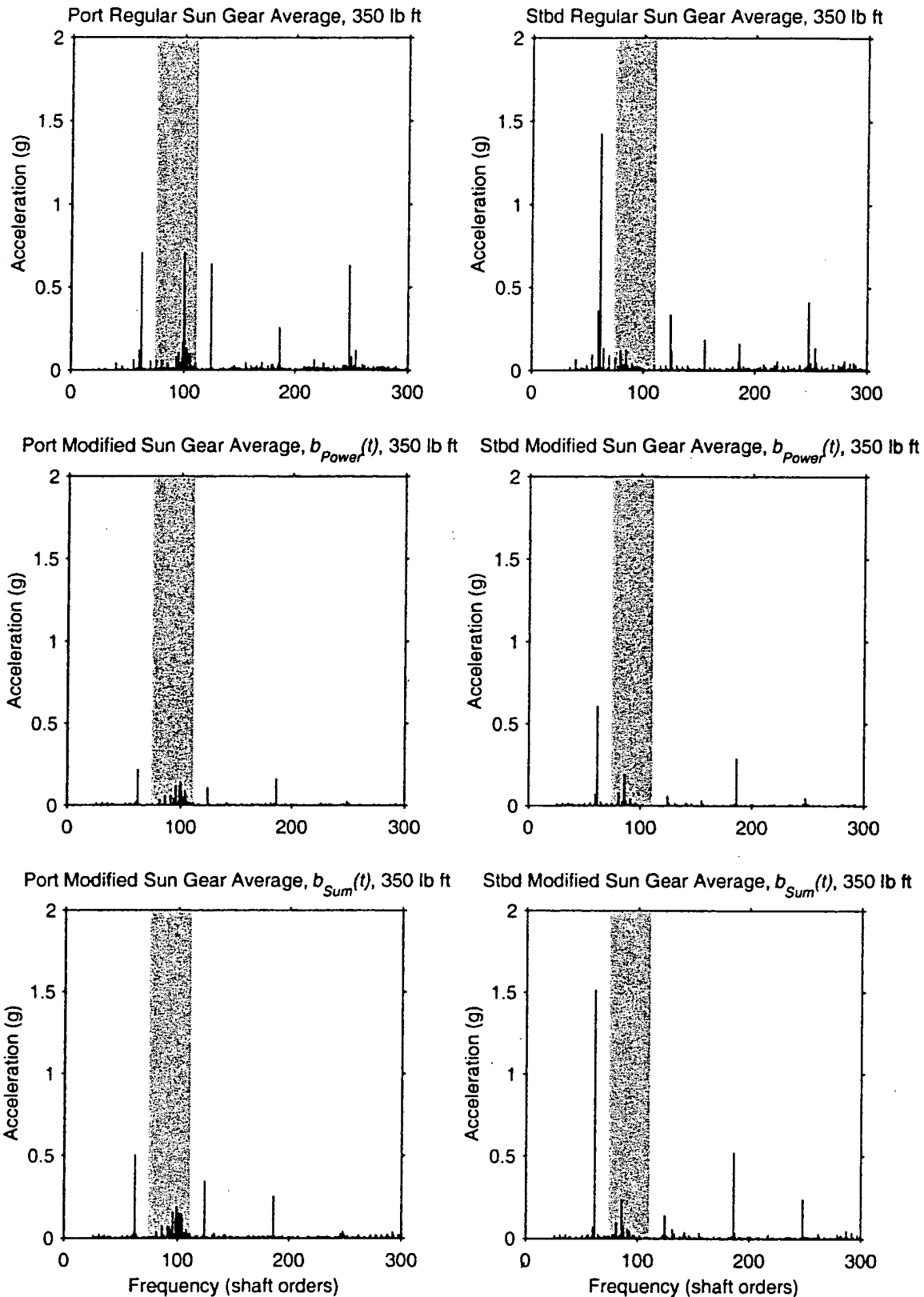


Figure 4.15: Spectra of sun gear averages at 350 lb ft torque showing resonance band.

18-30

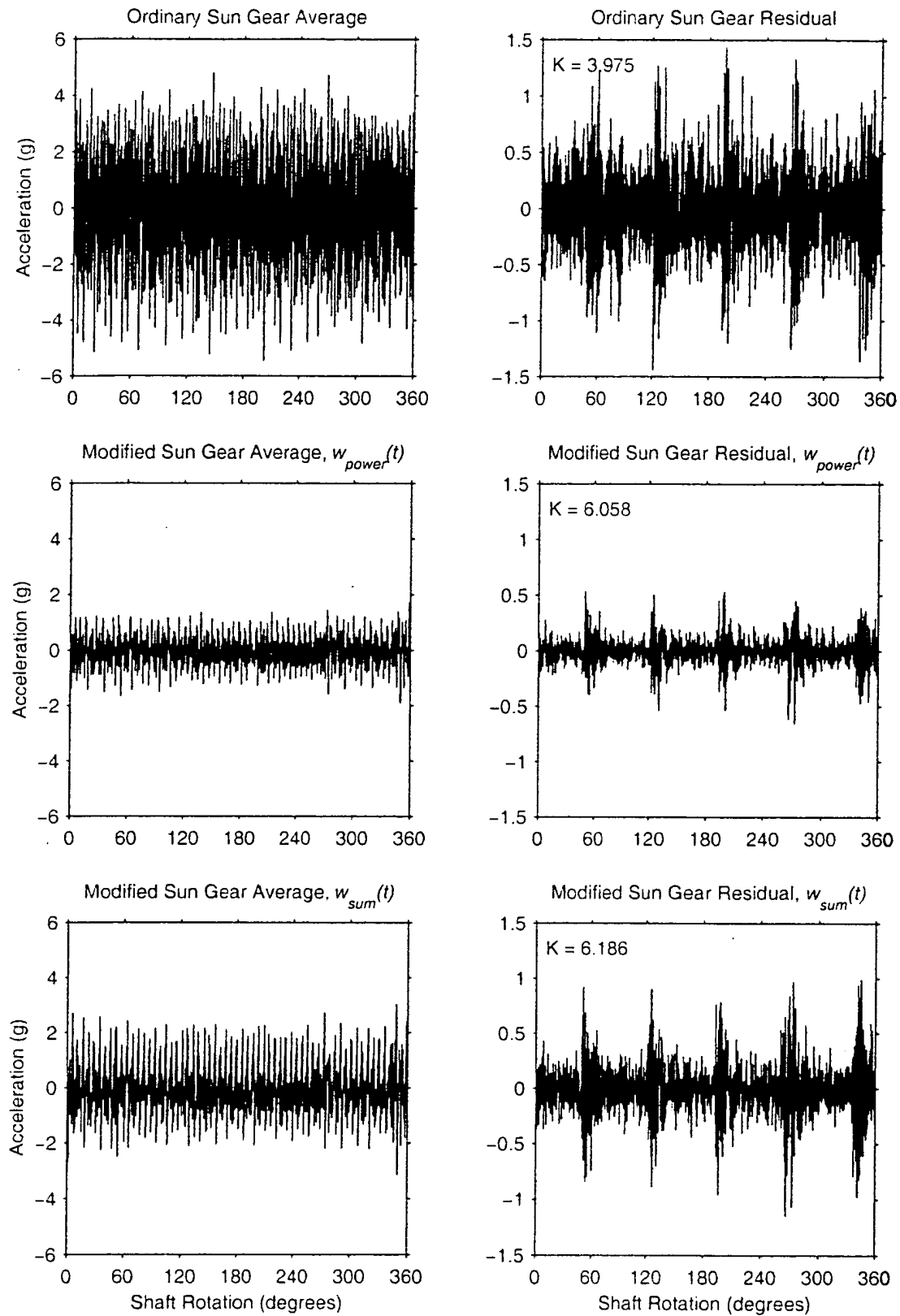


Figure 4.16: Sun gear averages, 425 lb ft torque, port ring accelerometer.

19-30

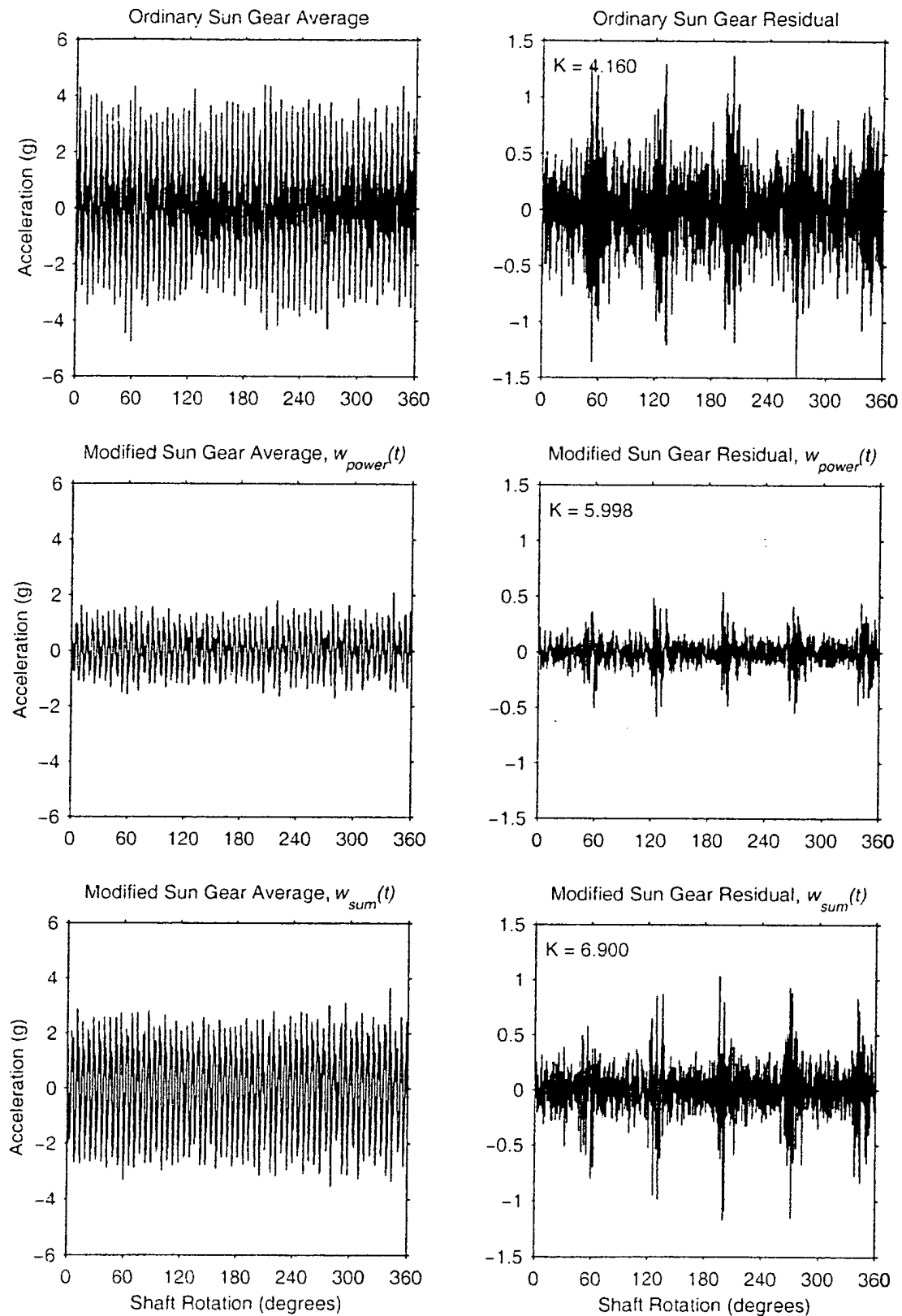


Figure 4.17: Sun gear averages, 425 lb ft torque, starboard ring accelerometer.

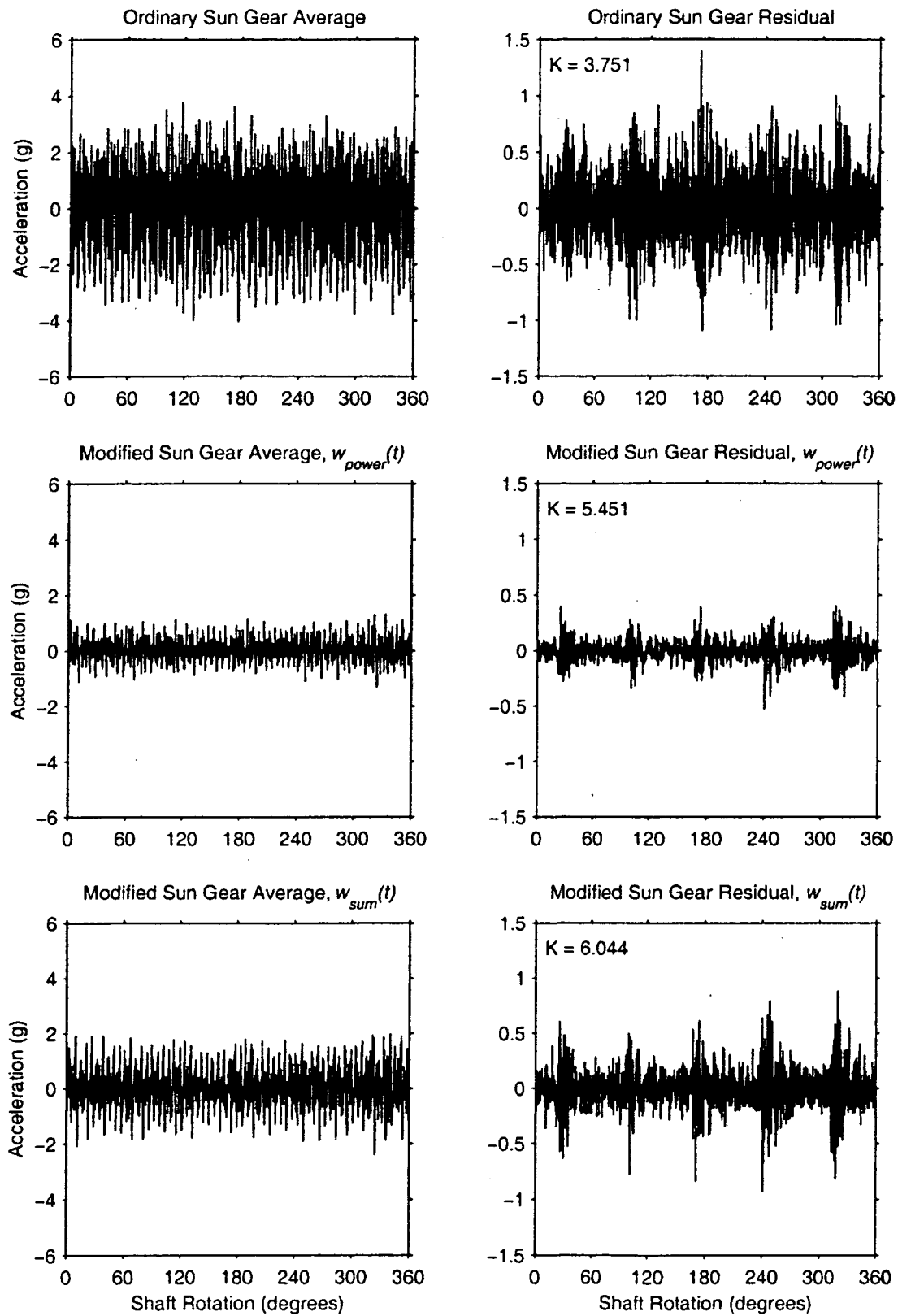


Figure 4.18: Sun gear averages. 350 lb ft torque. port ring accelerometer.

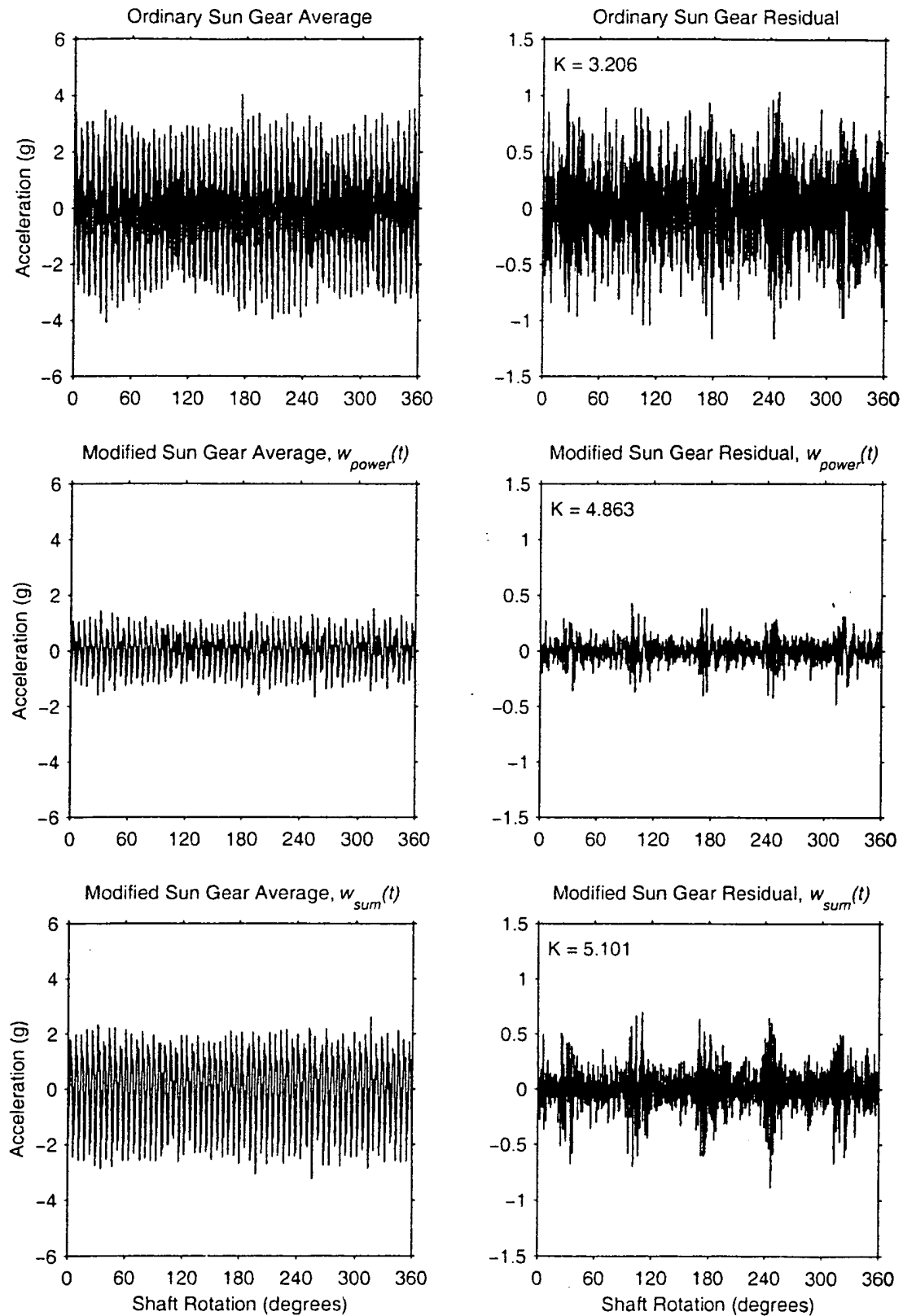


Figure 4.19: Sun gear averages, 350 lb ft torque, starboard ring accelerometer.

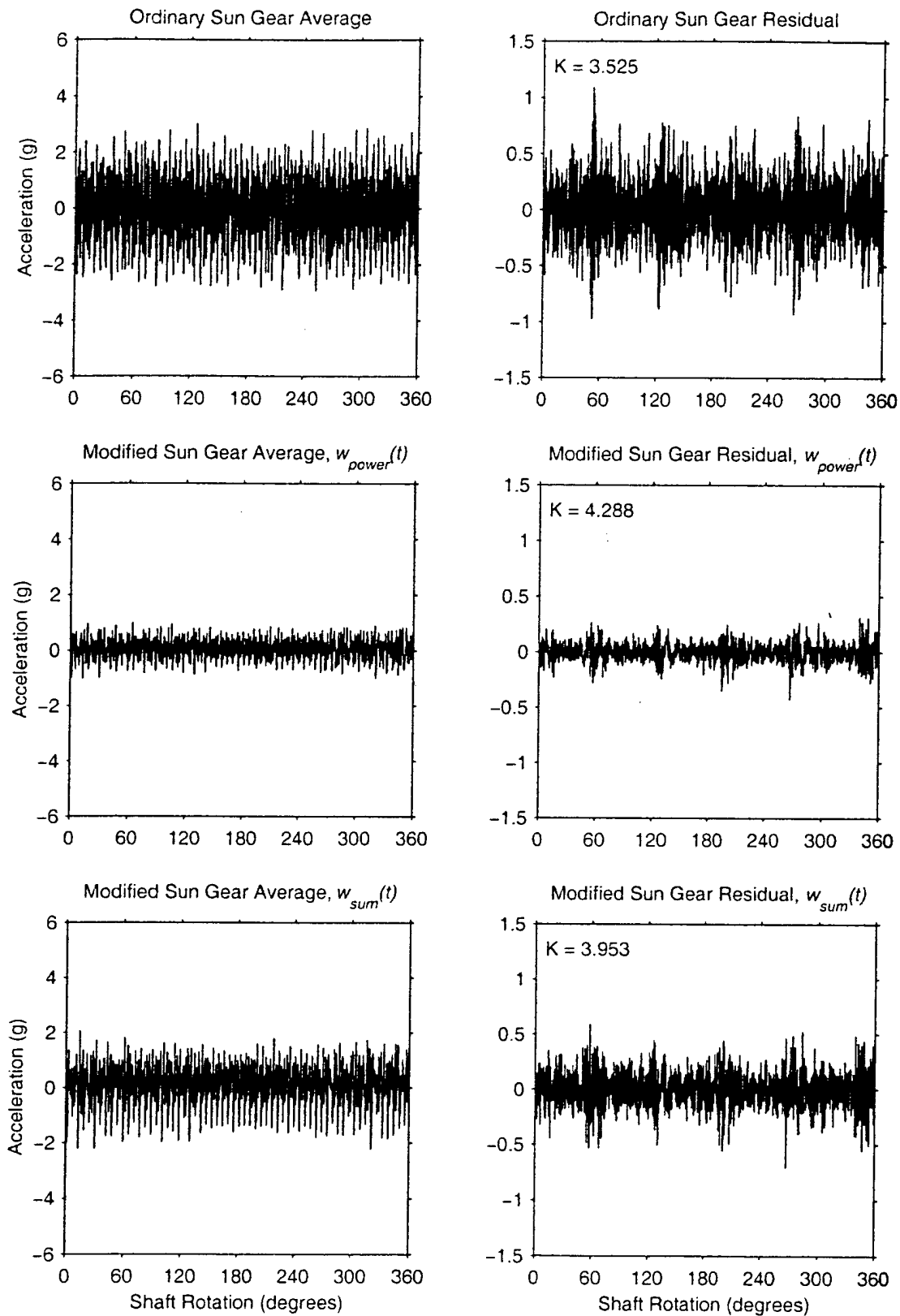


Figure 4.20: Sun gear averages, 300 lb ft torque, port ring accelerometer.

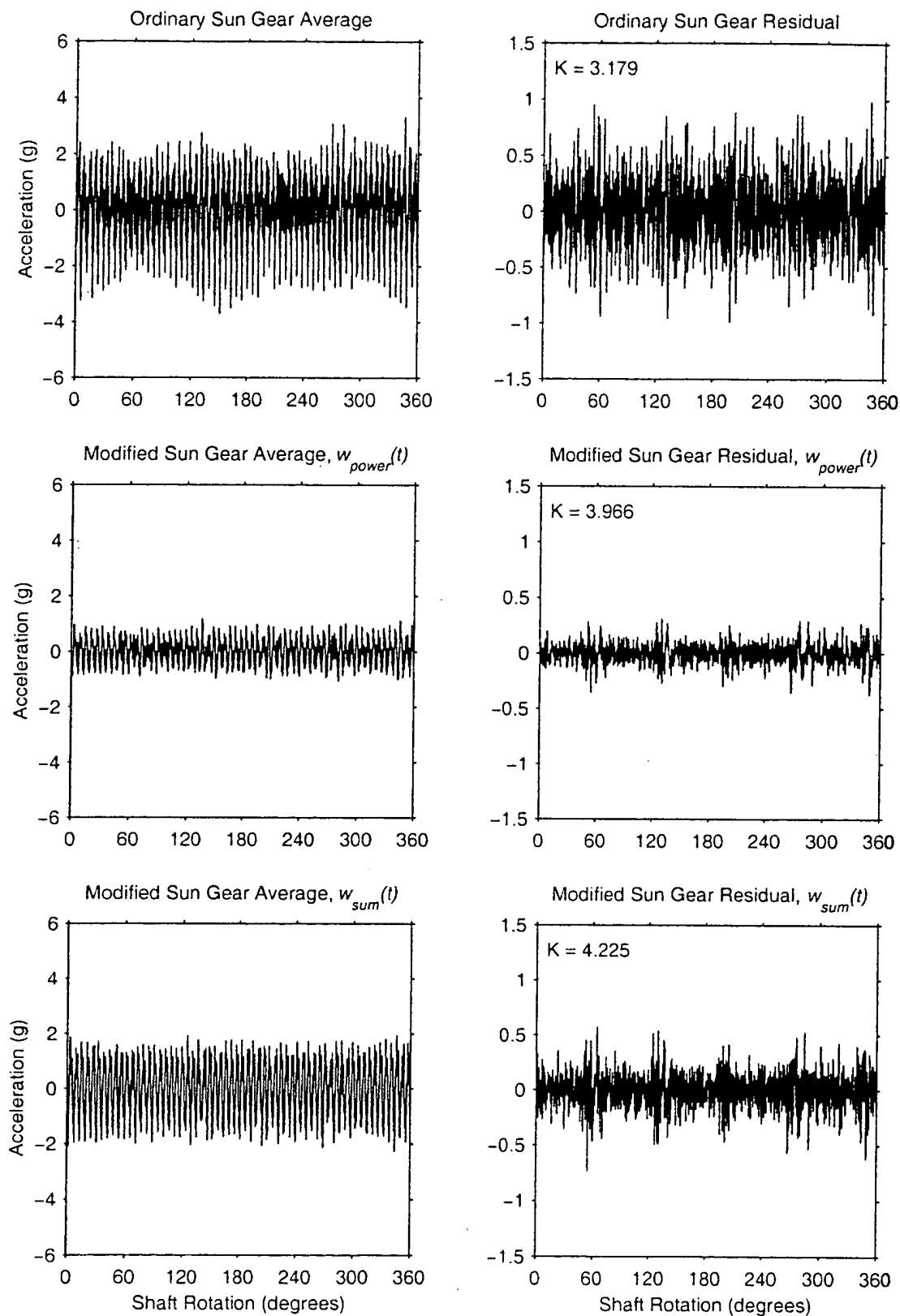


Figure 4.21: Sun gear averages, 300 lb ft torque, starboard ring accelerometer.



24-30

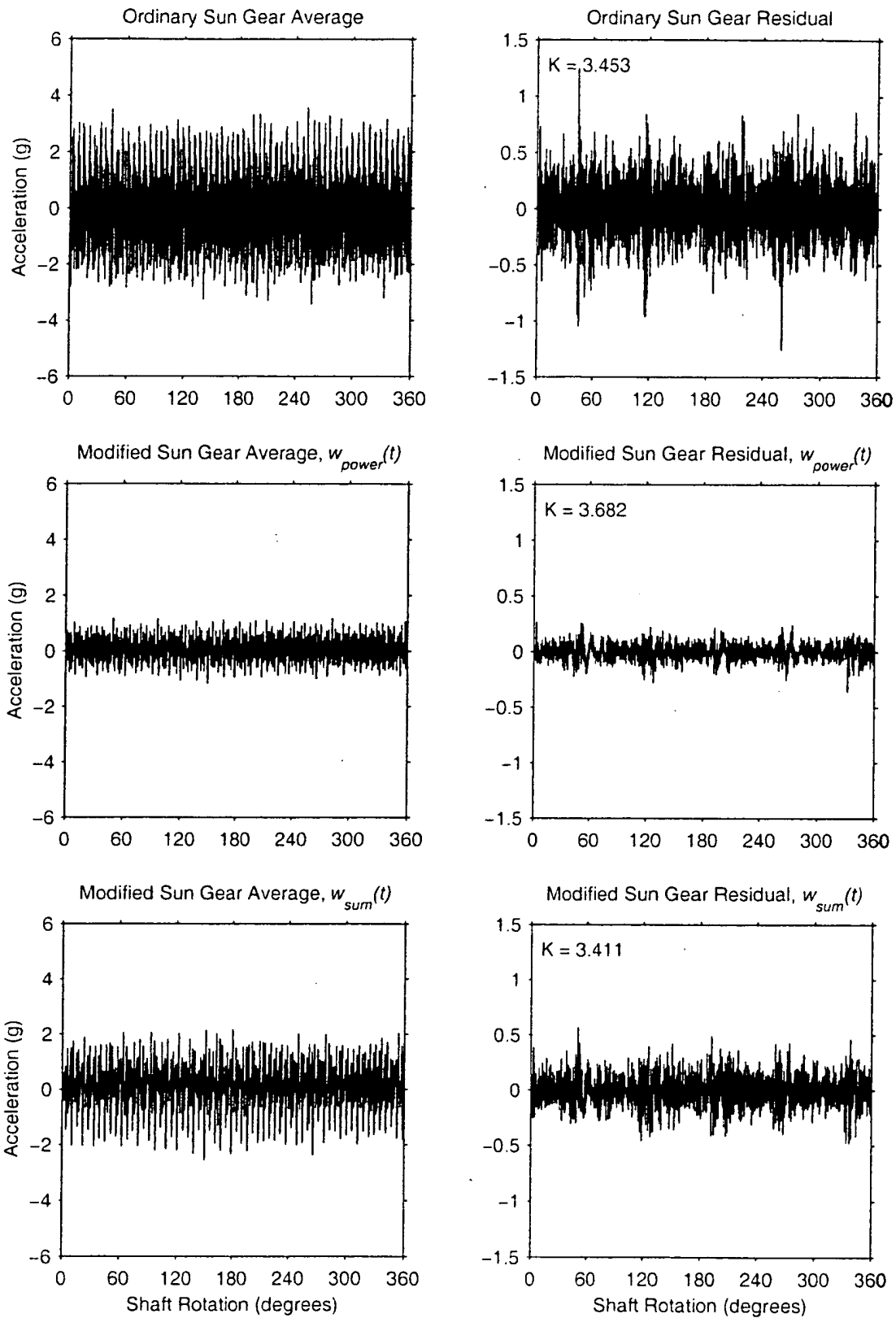


Figure 4.22: Sun gear averages, 250 lb ft torque, port ring accelerometer.

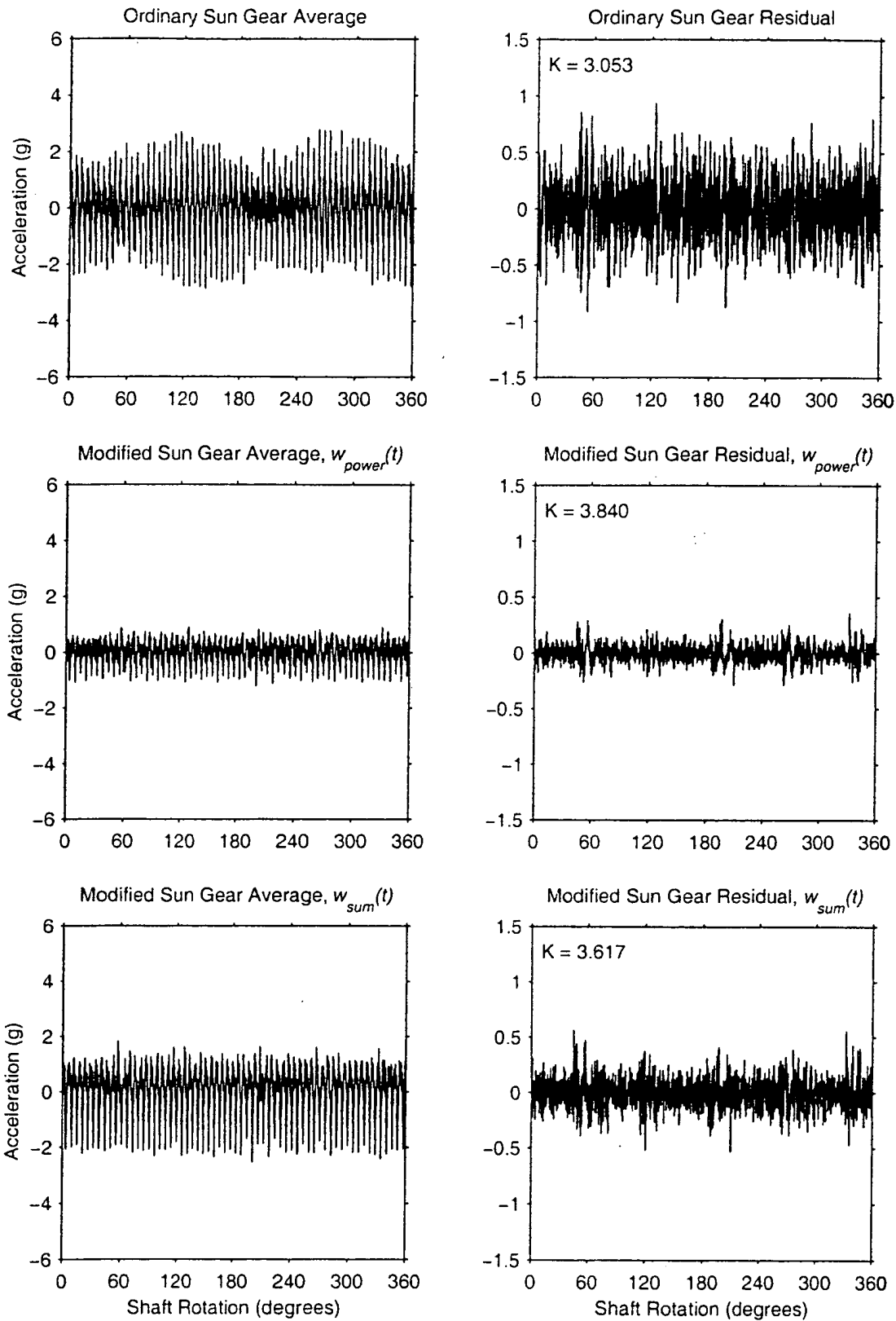


Figure 4.23: Sun gear averages, 250 lb ft torque, starboard ring accelerometer.

26-20

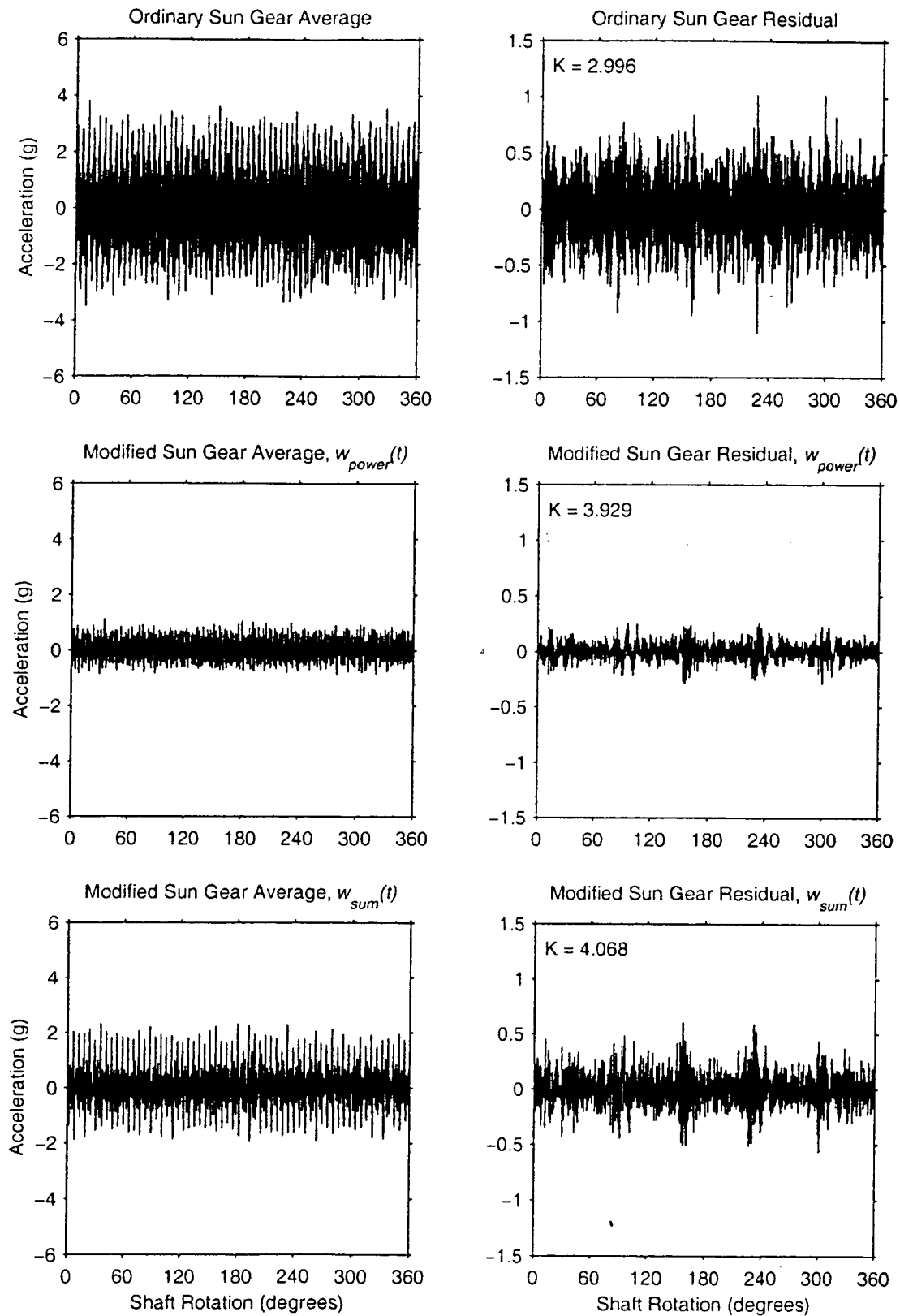


Figure 4.24: Sun gear averages, 200 lb ft torque, port ring accelerometer.

29-30

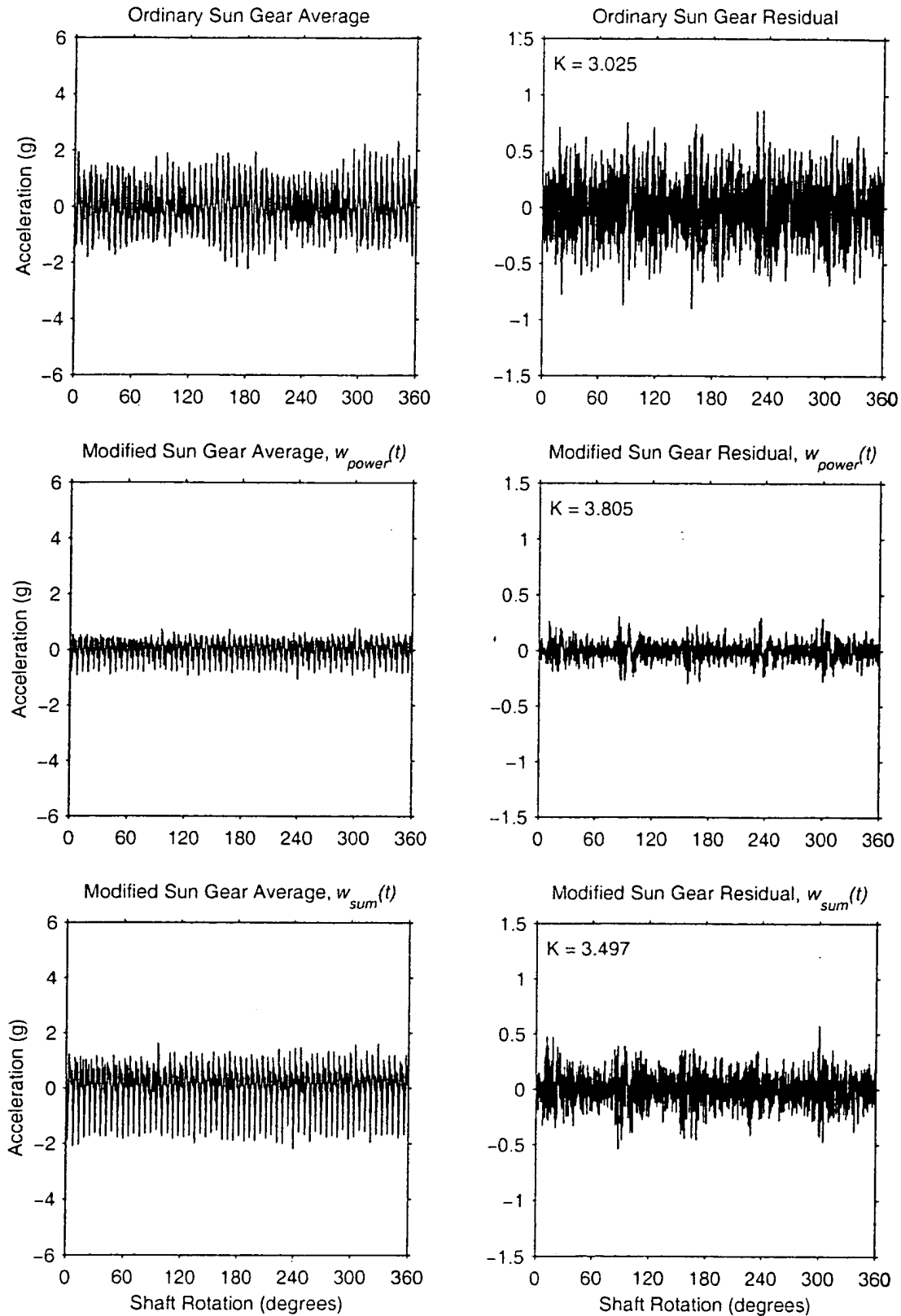


Figure 4.25: Sun gear averages, 200 lb ft torque, starboard ring accelerometer.

28-30

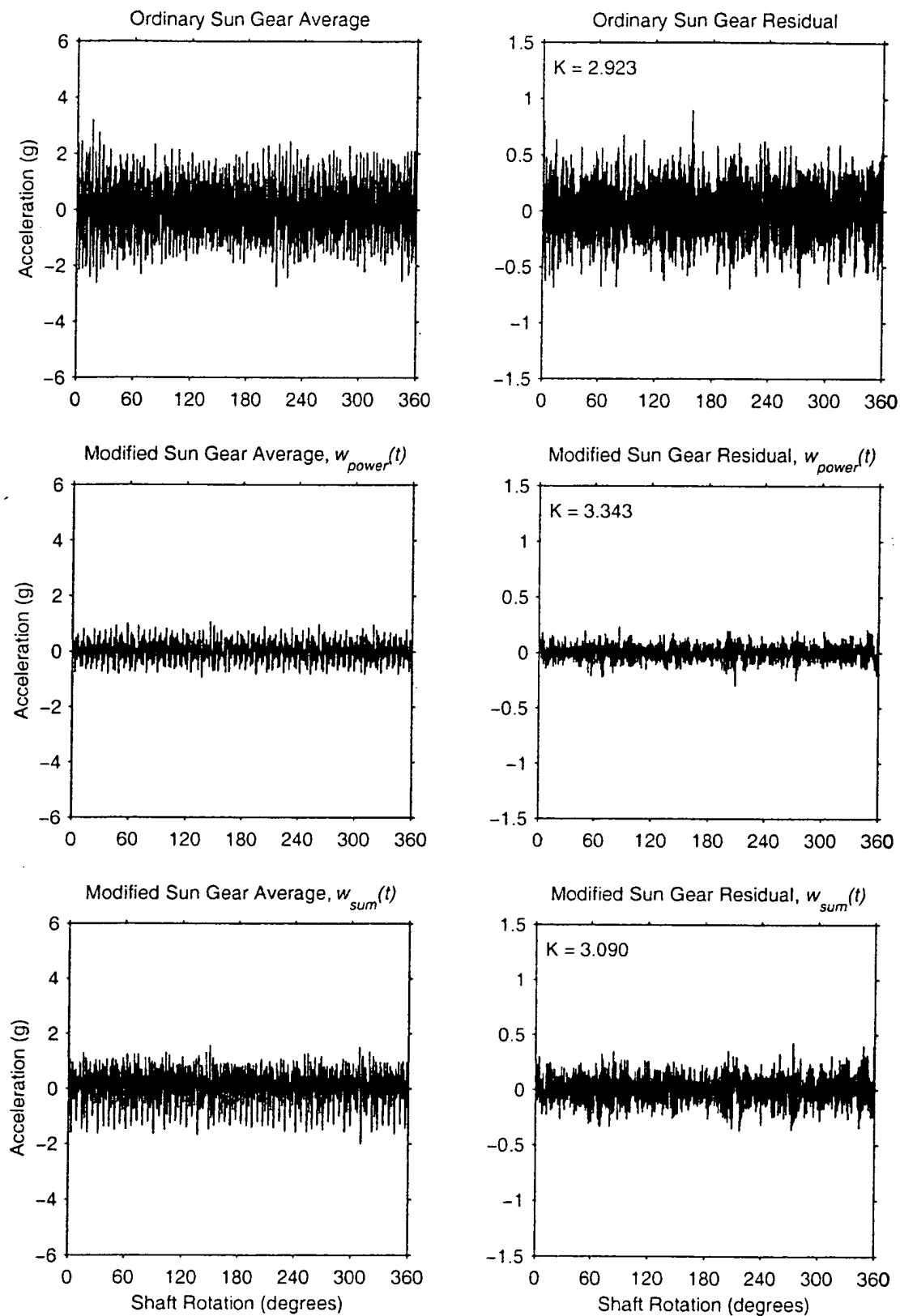


Figure 4.26: Sun gear averages, 165 lb ft torque, port ring accelerometer.

29 30

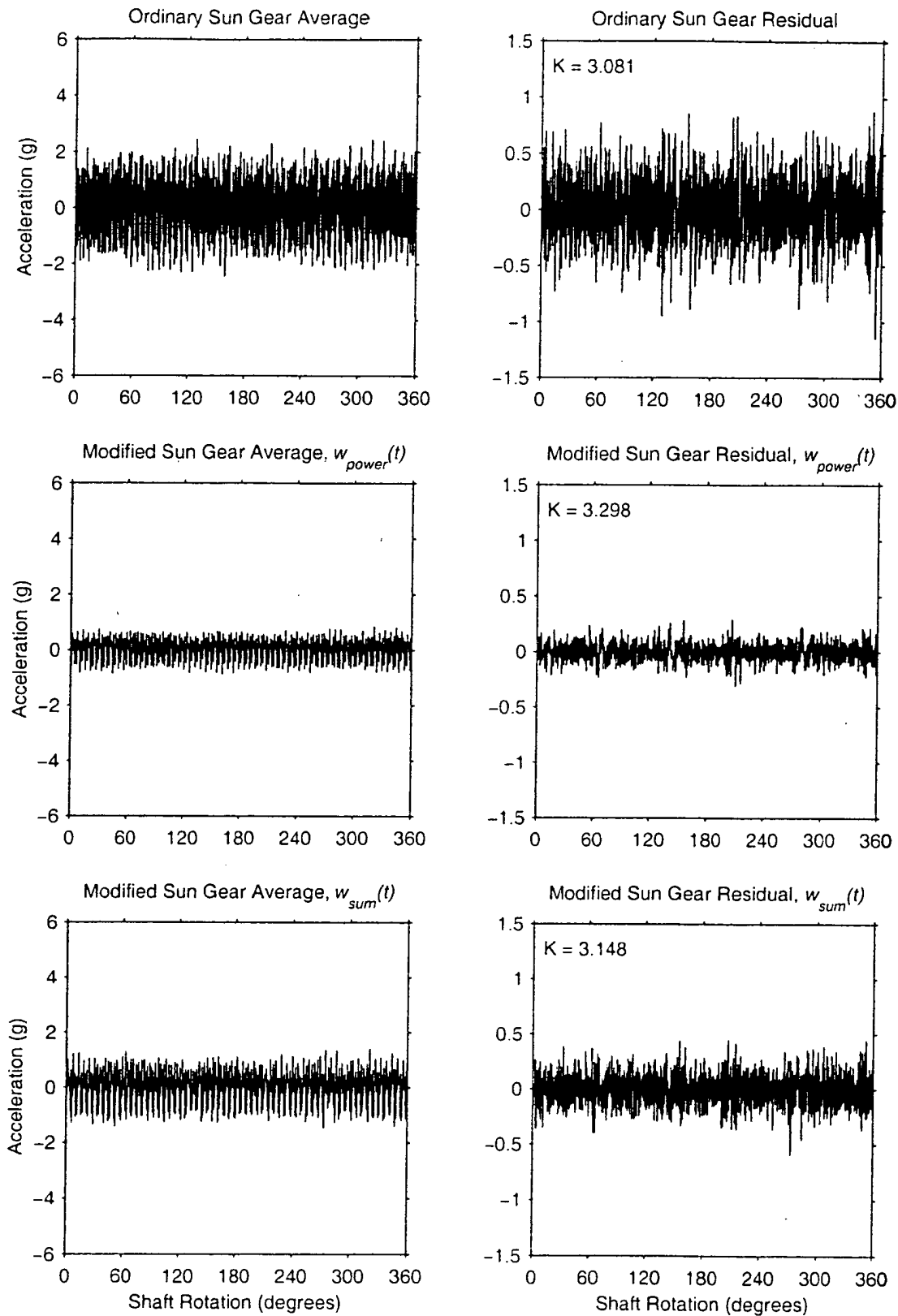


Figure 4.27: Sun gear averages, 165 lb ft torque, starboard ring accelerometer.

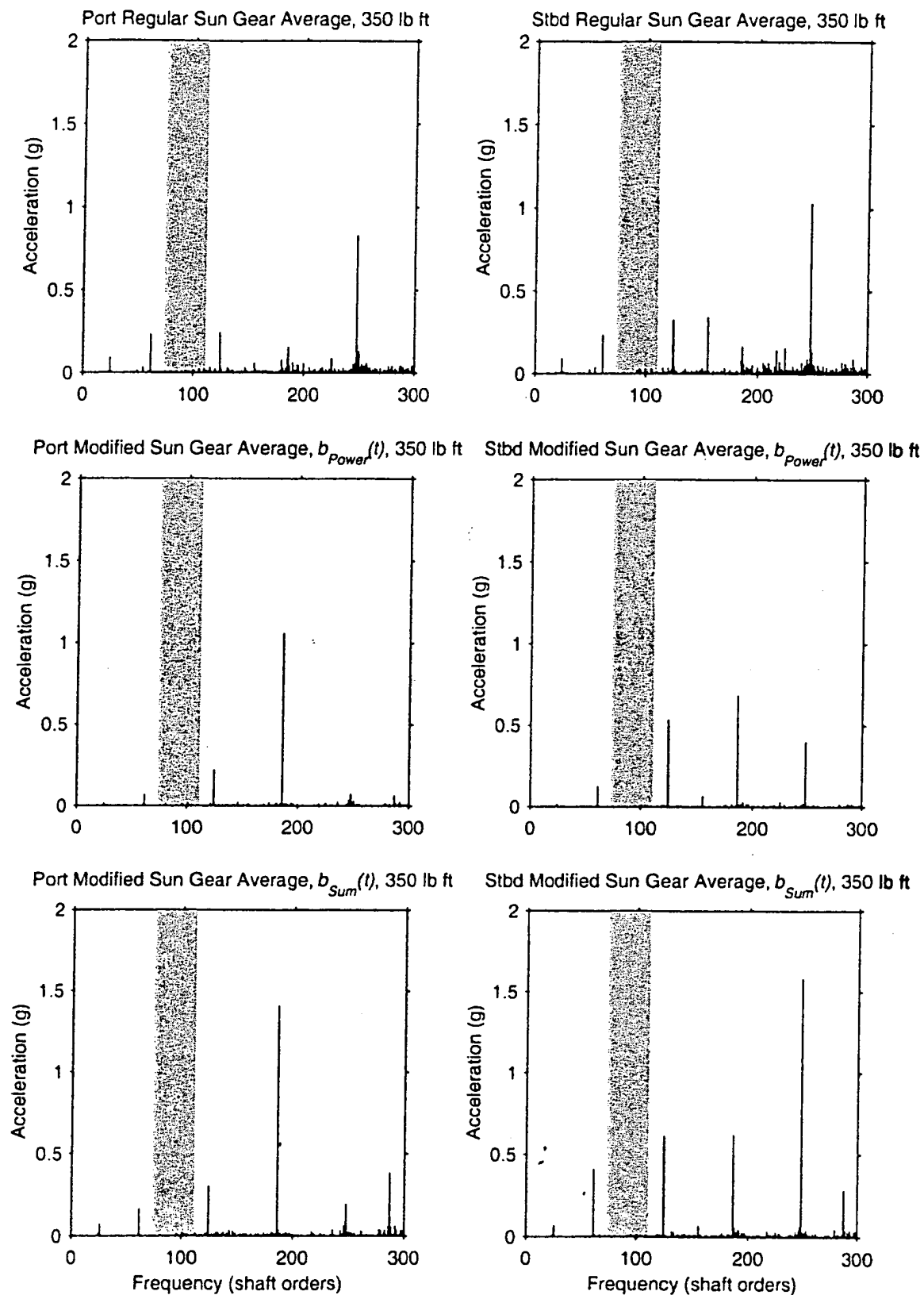


Figure 4.28: Spectra of sun gear averages at 350 lb ft from a gearbox without a sun gear fault.